

InterLab[®]

Final Report on

INARI10-LTBN-1

Report Reference: MDE_AAVAM_1402_FCCb
According to:
FCC 47 CFR Ch.1 Part 15 Subpart B

Date: October 02, 2014

Test Laboratory:

7Layers AG
Borsigstr. 11
40880 Ratingen
Germany



Note:

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

7Layers AG
Borsigstrasse 11
40880 Ratingen, Germany
Phone: +49 (0) 2102 749 0
Fax: +49 (0) 2102 749 350
www.7Layers.com

Aufsichtsratsvorsitzender •
Chairman of the Supervisory Board:
Peter Mertel
Vorstand • Board:
Dr. H.-J. Meckelburg
Dr. H. Ansorge

Registergericht • registered in:
Düsseldorf, HRB 44096
USt-IdNr • VAT No.:
DE 203159652
TAX No. 147/5869/0385

1 Administrative Data

1.1 Project Data

Project Responsible: Patrick Lomax
Date Of Test Report: 2014/10/02
Date of first test: 2014/07/23
Date of last test: 2014/10/01

1.2 Applicant Data

Company Name: Aava Mobile
Street: Nahkatehtaankatu 2
Oulu
City: 90130
Country: Finland
Contact Person: Kari Räisänen
Phone: +3588373800
Fax: +49 (0) 2102 749 380
E-Mail: kari.raisanen@aavamobile.com

1.3 Test Laboratory Data

The following list shows all places and laboratories involved for test result generation:

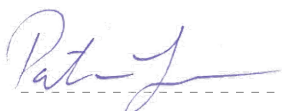
7 layers DE

Company Name : 7 layers AG
Street : Borsigstrasse 11
City : 40880 Ratingen
Country : Germany
Contact Person : Mr. Michael Albert
Phone : +49 2102 749 201
Fax : +49 2102 749 444
E Mail : Michael.Albert@7Layers.com

Laboratory Details

Lab ID	Identification	Accreditation Info
Lab 1	Conducted Emissions	DAkKS-Registration no. D-PL-12140-01-01
Lab 2	Radiated Emissions	DAkKS-Registration no. D-PL-12140-01-01

1.4 Signature of the Testing Responsible



Patrick Lomax
responsible for tests performed in: Lab 1, Lab 2

1.5 Signature of the Accreditation Responsible

B. RETKA [B. RETKA]

Accreditation scope responsible person
responsible for Lab 1, Lab 2

2 Test Object Data

2.1 General OUT Description

The following section lists all OUTs (Object's Under Test) involved during testing.

OUT: INARI 10 LTE

Type / Model / Family:	INARI10-LTBN-1
Product Category:	Mobile Computer
Manufacturer:	
Company Name:	Please see applicant data
Contact Person:	-
Parameter List:	
Parameter name	Value

Ancillary Equipment: AC/DC adapter

Product Category: Computer Accessory

Ancillary Equipment: IN0201-1 Tablet Dock

Type / Model / Family: FCC.ID: 2ABVH-IN020101
IC:11875A-IN020101

Product Category: Computer Accessory

Ancillary Equipment: Micro-USB cable

Product Category: Computer Accessory

2.2 Detailed Description of OUT Samples

Sample : AD01

<i>OUT Identifier</i>	INARI 10 LTE		
<i>Sample Description</i>	Radiated Sample		
<i>Serial No.</i>	KX14190232		
<i>Low Voltage</i>	3.6 V	<i>Low Temp.</i>	-10 °C
<i>High Voltage</i>	4.35 V	<i>High Temp.</i>	55 °C
<i>Nominal Voltage</i>	3.8 V	<i>Normal Temp.</i>	25 °C

Sample : cdc01

<i>OUT Identifier</i>	AC/DC adapter
<i>Sample Description</i>	AC Adapter
<i>Serial No.</i>	053W3370003

Sample : Dock1

<i>OUT Identifier</i>	IN0201-1 Tablet Dock
<i>Sample Description</i>	Docking station for Tablet
<i>Serial No.</i>	0001
<i>HW Status</i>	Pre-Production Sample

Sample : sb1

<i>OUT Identifier</i>	Micro-USB cable
<i>Sample Description</i>	USB Cable

2.3 OUT Features

Supported Features for OUT: INARI 10 LTE

Designation	Description	Supported Value(s)
Features for scope: FCC_v2		
AC	The OUT is powered by or connected to AC Mains	
BT	EUT supports Bluetooth data rate of 1 Mbps with GFSK modulation in the band 2400 MHz - 2483.5 MHz	
BTLE	Support of Bluetooth Low Energy	
EDGE850	EUT supports EDGE in the band 824 MHz - 849 MHz	
EDGE1900	EUT supports EDGE in the band 1850 MHz - 1910 MHz	
EDR2	EUT supports Bluetooth using data rate of 2 Mbps with PI/4 DQPSK modulation in the band 2400 MHz - 2483.5 MHz	
EDR3	EUT supports Bluetooth using data rate of 3 Mbps with 8DPSK modulation in the band 2400 MHz - 2483.5 MHz	
FDD2	EUT supports UMTS FDD2 in the band 1850 MHz - 1910 MHz	
FDD4	EUT supports UMTS FDD4 in the band 1710 MHz - 1755 MHz	
FDD5	EUT supports UMTS FDD5 in the band 824 MHz - 849 MHz	
GSM850	EUT supports GSM850 band 824MHz - 849MHz	
HSDPA-FDD2	EUT supports UMTS FDD2 HSDPA in the band 1850 MHz - 1910 MHz	
HSDPA-FDD4	EUT supports UMTS FDD4 HSDPA in the band 1710 MHz - 1755 MHz	
HSDPA-FDD5	EUT supports UMTS FDD5 HSDPA in the band 824 MHz - 849 MHz	
HSUPA-FDD2	EUT supports UMTS FDD2 HSUPA in the band 1850 MHz - 1910 MHz	
HSUPA-FDD4	EUT supports UMTS FDD4 HSUPA in the band 1710 MHz - 1755 MHz	
HSUPA-FDD5	EUT supports UMTS FDD5 HSUPA in the band 824 MHz - 849 MHz	
Iant	Integral Antenna: permanent fixed antenna, which may be built-in, designed as an indispensable part of the equipment	
PCS1900	EUT supports PCS1900 band 1850MHz - 1910MHz	
SRD	EUT is a short range device	
TantC	temporary antenna connector, which may be only built-in for testing, designed as an example part of the equipment	
Wa1	EUT supports WLAN in mode a in the band 5150 MHz - 5250 MHz	
Wa2	EUT supports WLAN in mode a in the band 5250 MHz - 5350 MHz	
Wa3	EUT supports WLAN in mode a in the band 5470 MHz - 5725 MHz	
Wa4	EUT supports WLAN in mode a in the band 5725 MHz - 5825 MHz	
Wa5	EUT supports WLAN in mode a in the band 5725 MHz - 5850 MHz	
Wa6	EUT supports WLAN in mode a in the band 5745 MHz - 5805 MHz	
Wa7	EUT supports WLAN in mode a in the band 5180 MHz - 5240 MHz	
Wa8	EUT supports WLAN in mode a in the band 5260 MHz - 5320 MHz	
Wa9	EUT supports WLAN in mode a in the band 5500 MHz - 5600 MHz	
Wa10	EUT supports WLAN in mode a in the band 5650 MHz - 5700 MHz	
Wb	EUT supports WLAN in mode b in the band 2400 MHz - 2483.5 MHz	
Wg	EUT supports WLAN in mode g in the band 2400 MHz - 2483.5 MHz	
WLAN	EUT supports WLAN channels 2412 MHz - 2462 MHz.	
Wn	EUT supports WLAN in mode n in the band 2400 MHz - 2483.5 MHz	

2.4 Auxiliary Equipment

AE No.	Type Designation	Serial No.	HW Status	SW Status	Description
AE 09	E119932-U with 2 fixed mounted				HDMI Cable
AE 02	Fujitsu ADP-80NB A	07Y17323A	120V/60Hz AC		AC adapter
AE 01	Fujitsu Siemens Lifebook Eseries	DSCK013817		Windows 7 Pro	Laptop RE
AE 03	Logitech M-BT58	HC60915A2XC			Mouse
AE 04	Logitech Ultrax Media Keyboard	ST635J01624			Keyboard
AE 11	Netgear WNDR3300	1TS1847F01363			WLAN access point
AE 05	NXP NFC passive tag				NFC Tag
AE 10	R&M freenet Real 10 S/FTP Cat. 6				LAN Cable ca. 3.2m
AE 08	Samsung AD-3014A		120V/60Hz AC		ACDC Power adapter
AE 07	Samsung S22B350H	0166H4MC40232 8Y			Monitor
AE 06	USB Memory Stick SONY 16 GB				USB Memory Stick

2.5 Setups used for Testing

For each setup a relation is given to determine if and which samples and auxiliary equipment is used. The left side list all OUT samples and the right side lists all auxiliary equipment for the given setup.

Setup No.	List of OUT samples		List of auxiliary equipment	
	Sample No.	Sample Description	AE No.	AE Description
AC_AD01	(AC Charger setup)			
	Sample: cdc01	AC Adapter		
	Sample: sb1	USB Cable		
	Sample: AD01	Radiated Sample		
PC_AD01	(Computer peripheral setup)			
	Sample: Dock1	Docking station for Tablet	AE 09	HDMI Cable
	Sample: AD01	Radiated Sample	AE 02	AC adapter
			AE 01	Laptop RE
			AE 03	Mouse
			AE 04	Keyboard
			AE 11	WLAN access point
			AE 05	NFC Tag
			AE 10	LAN Cable ca. 3.2m
			AE 08	ACDC Power adapter
			AE 07	Monitor
			AE 06	USB Memory Stick

3 Results

3.1 General

Documentation of tested devices:

Available at the test laboratory.

Interpretation of the test results:

The results of the inspection are described on the following pages, where 'Conformity' or 'Passed' means that the certification criteria were verified and that the tested device is conform to the applied standard.

In cases where 'Declaration' is printed, the required documents are available in the manufacturers product documentation.

In cases where 'not applicable' is printed, the test case requirements are not relevant to the specific equipment implementation.

Note:

1. This report contains the abbreviated information content pertaining to services rendered. Supporting documentation not included herein is maintained and available at the laboratory.

2. All tests are performed under environmental conditions within the requirements of the specifications. Environmental conditions are available at the laboratory.

3.2 List of the Applicable Body

(Body for Scope: FCC_v2)

<i>Designation</i>	<i>Description</i>
FCC47CFRChIPART15bRADIO FREQUENCY DEVICES	Part 15, Subpart B - Unintentional Radiators

3.3 List of Test Specification

<i>Test Specification:</i>	FCC part 2 and 15
<i>Version</i>	10-1-13 Edition
<i>Title:</i>	PART 2 - GENERAL RULES AND REGULATIONS PART 15 - RADIO FREQUENCY DEVICES

3.4 Summary

<i>Test Case Identifier / Name</i>	<i>Verdict</i>	<i>Date of Test</i>	<i>Lab Ref.</i>	<i>Setup</i>
15b.1 Conducted Emissions (AC Power Line) §15.107				
15b.1; Mode = generating a high power consumption	Passed	2014/10/01	Lab 1	PC_AD01
	Passed	2014/10/01	Lab 1	AC_AD01
15b.2 Spurious Radiated Emissions §15.109				
15b.2; Mode = generating a high power consumption	Passed	2014/07/23	Lab 2	AC_AD01
	Passed	2014/07/23	Lab 2	PC_AD01

3.5 Detailed Results

3.5.1 15b.1 Conducted Emissions (AC Power Line) §15.107

Test1: 15b.1; Mode = generating a high power consumption

<i>Result:</i>	Passed
<i>Setup No.:</i>	AC_AD01
<i>Date of Test:</i>	2014/10/01 9:44
<i>Body:</i>	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
<i>Test Specification:</i>	FCC part 2 and 15

Detailed Results:

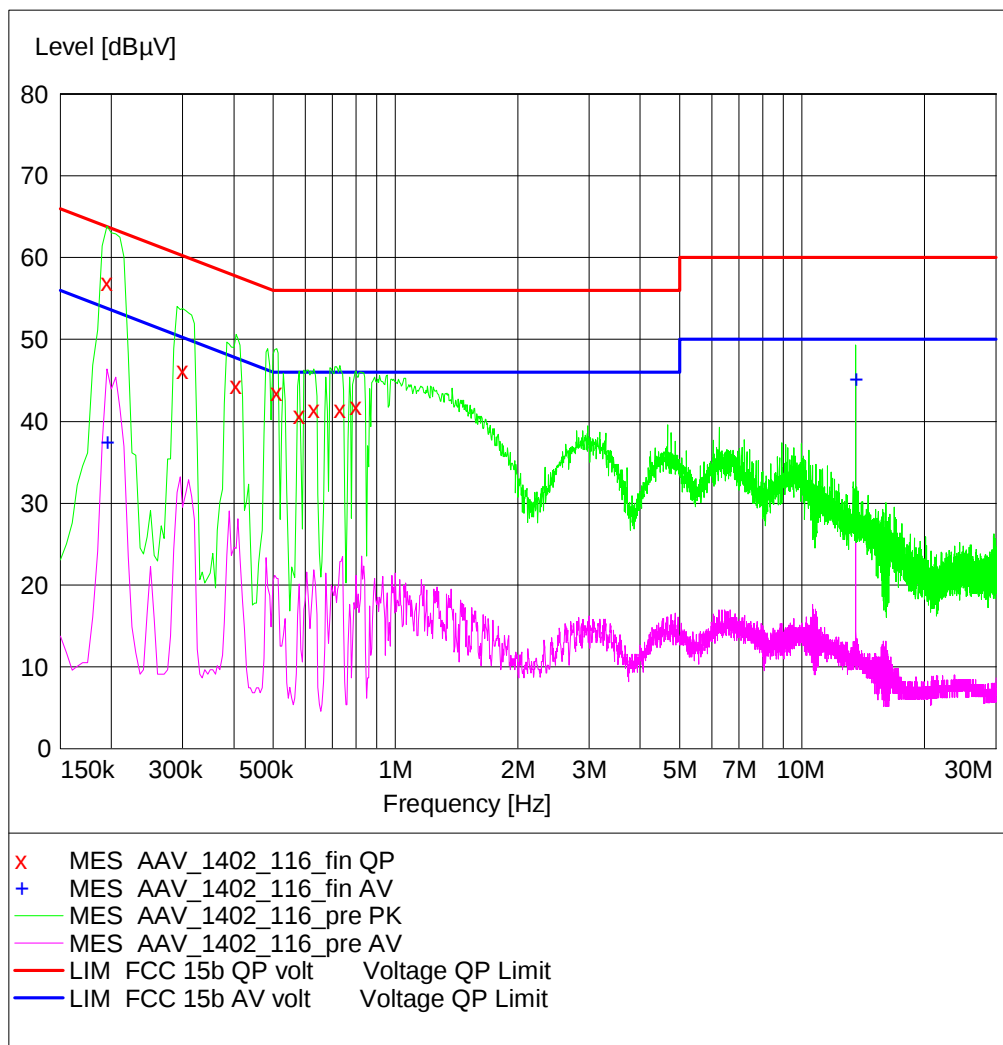
AC MAINS CONDUCTED

Class B

EUT: (DE1004003ad01)
Manufacturer: AAVA Mobile
Operating Condition: WLAN TX on 2437 MHz, NFC on, GSM 1900 traffic mode
Test Site: 7 layers Ratingen
Operator: URO
Test Specification: ANSI C63.4; FCC 15.107 / 15.207
Comment: setup with US-charger , 120 V / 60 Hz
Start of Test: 01.10.2014 / 09:24:27

SCAN TABLE: "FCC Voltage"

Short Description:			FCC Voltage	Meas.	IF	Transducer
Start	Stop	Step	Detector	Time	Bandw.	
Frequency	Frequency	Width				
150.0 kHz	30.0 MHz	5.0 kHz	MaxPeak	20.0 ms	9 kHz	ESH3-Z5
			Average			



MEASUREMENT RESULT: "AAV_1402_116_fin QP"

01.10.2014 09:30

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.195000	57.00	10.1	64	6.8	N	FLO
0.300000	46.20	10.1	60	14.0	N	GND
0.405000	44.40	10.1	58	13.3	L1	FLO
0.510000	43.50	10.1	56	12.5	N	GND
0.580000	40.80	10.1	56	15.2	N	GND
0.630000	41.50	10.1	56	14.5	L1	FLO
0.730000	41.50	10.1	56	14.5	L1	GND
0.800000	41.90	10.1	56	14.1	N	FLO

MEASUREMENT RESULT: "AAV_1402_116_fin AV"

01.10.2014 09:30

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.195000	37.40	10.1	54	16.4	N	FLO
13.560000	45.10	10.7	50	4.9	N	FLO

Test2: 15b.1; Mode = generating a high power consumption

Result: Passed

Setup No.: PC_AD01

Date of Test: 2014/10/01 9:45

Body: FCC47CFRChIPART15bRADIO FREQUENCY DEVICES

Test Specification: FCC part 2 and 15

Detailed Results:

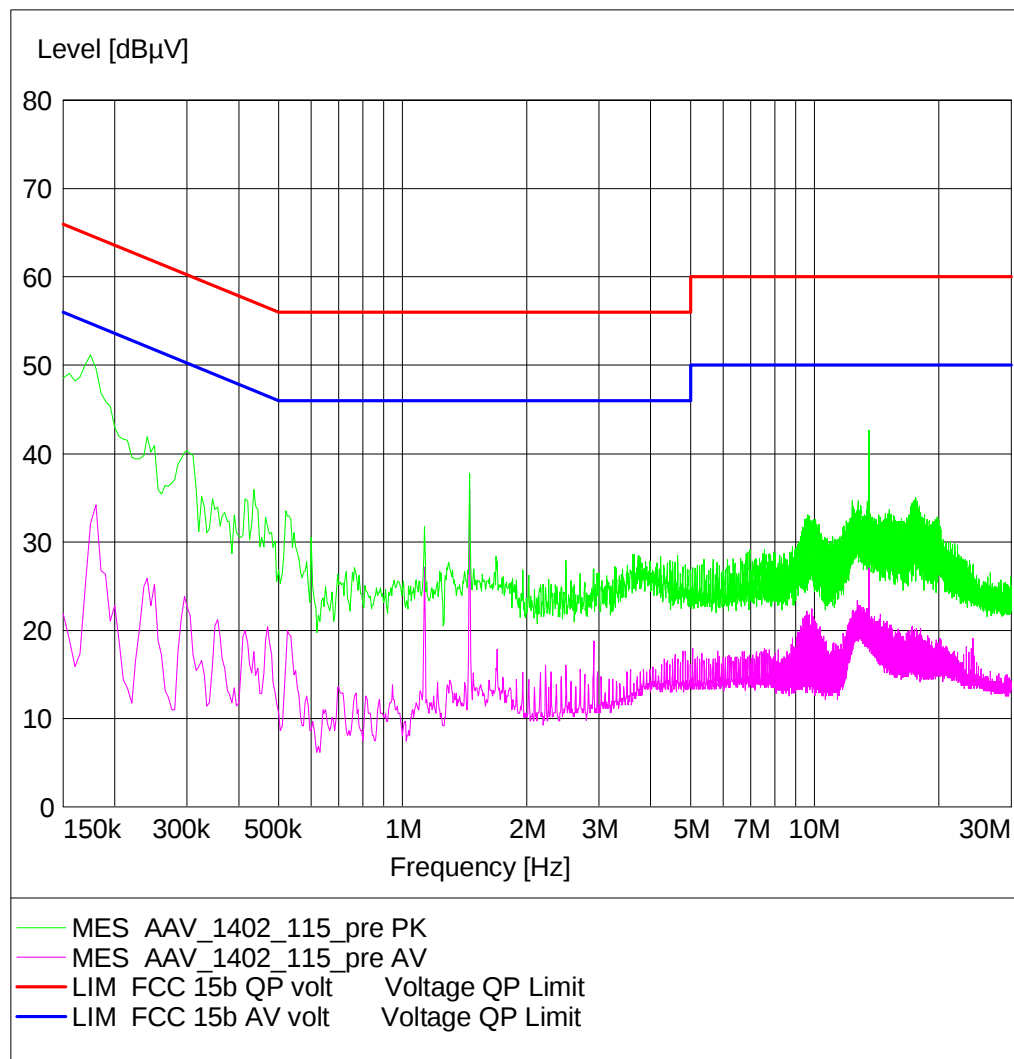
AC MAINS CONDUCTED

Class B

EUT: (DE1004003ad01)
Manufacturer: AAVA Mobile
Operating Condition: WLAN TX on 2437 MHz, NFC on, pinging, GSM 1900 traffic mode
Test Site: 7 layers Ratingen
Operator: URO
Test Specification: ANSI C63.4; FCC 15.107 / 15.207
Comment: computer peripheral setup with docking station, 120 V / 60 Hz
Start of Test: 01.10.2014 / 09:08:00

SCAN TABLE: "FCC Voltage"

Short Description:			FCC Voltage				
Start	Stop	Step	Detector	Meas.	IF	Transducer	
Frequency	Frequency	Width		Time	Bandw.		
150.0 kHz	30.0 MHz	5.0 kHz	MaxPeak	20.0 ms	9 kHz	ESH3-Z5	
			Average				



3.5.2 15b.2 Spurious Radiated Emissions §15.109

Test1: 15b.2; Mode = generating a high power consumption

<i>Result:</i>	Passed
<i>Setup No.:</i>	PC_AD01
<i>Date of Test:</i>	2014/07/23 9:42
<i>Body:</i>	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
<i>Test Specification:</i>	FCC part 2 and 15

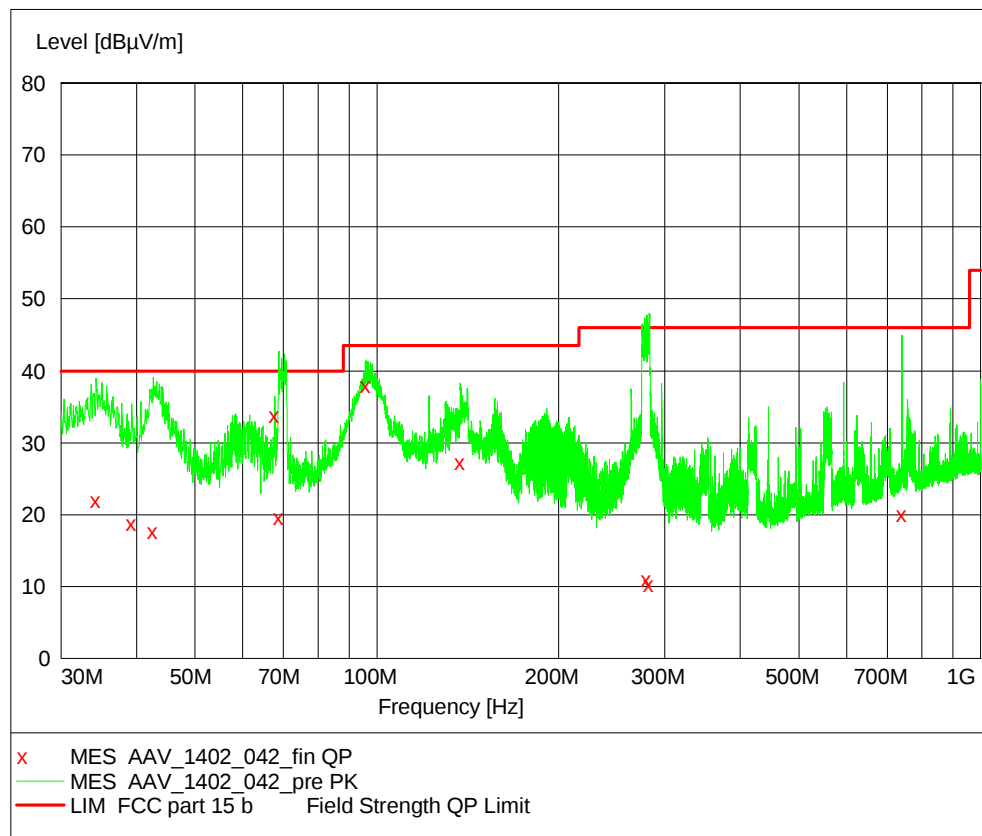
Detailed Results:

EMI RADIATED TEST

EUT: (DE1004003ae01)
Manufacturer: AAVAM
Operating Condition: 120V/60Hz, GSM 1900 traffic + WLAN TX on 2437 MHz, g-mode + NFC on 13,56 MHz + LAN active with Ping + HDMI active
Test Site: 7 layers, Ratingen
Operator: Mit
Test Specification: FCC part 15 b 120v/60Hz AC
Comment: Horizontal EUT position, Setup_02, comp. peri.
Start of Test: 23.07.2014 / 10:25:13

SCAN TABLE: "FCC part 15 b"

Short Description:	FCC part 15 b
Start	Stop
Frequency	Frequency
30.0 MHz	1.0 GHz
Step	Width
60.0 kHz	MaxPeak
Detector	Meas. Time
IF	Bandw.
Transducer	HL562



MEASUREMENT RESULT: "AAV_1402_042_fin QP"

23.07.2014 11:14								
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation	
34.320000	22.00	18.8	40.0	18.0	104.0	180.00	VERTICAL	
39.300000	18.70	16.2	40.0	21.3	104.0	193.00	VERTICAL	
42.660000	17.70	14.3	40.0	22.3	100.0	157.00	VERTICAL	
67.800000	33.80	8.1	40.0	6.2	192.0	202.00	VERTICAL	
68.880000	19.60	8.5	40.0	20.4	184.0	202.00	VERTICAL	
96.000000	38.00	11.2	43.5	5.5	121.0	22.00	VERTICAL	
137.640000	27.20	10.8	43.5	16.3	113.0	202.00	VERTICAL	
280.080000	11.00	12.4	46.0	35.0	196.0	165.00	VERTICAL	
282.840000	10.30	12.4	46.0	35.7	213.0	157.00	VERTICAL	
741.780000	20.00	21.2	46.0	26.0	125.0	157.00	VERTICAL	

Test1: 15b.2; Mode = generating a high power consumption

<i>Result:</i>	Passed
<i>Setup No.:</i>	AC_AD01
<i>Date of Test:</i>	2014/07/23 9:43
<i>Body:</i>	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
<i>Test Specification:</i>	FCC part 2 and 15

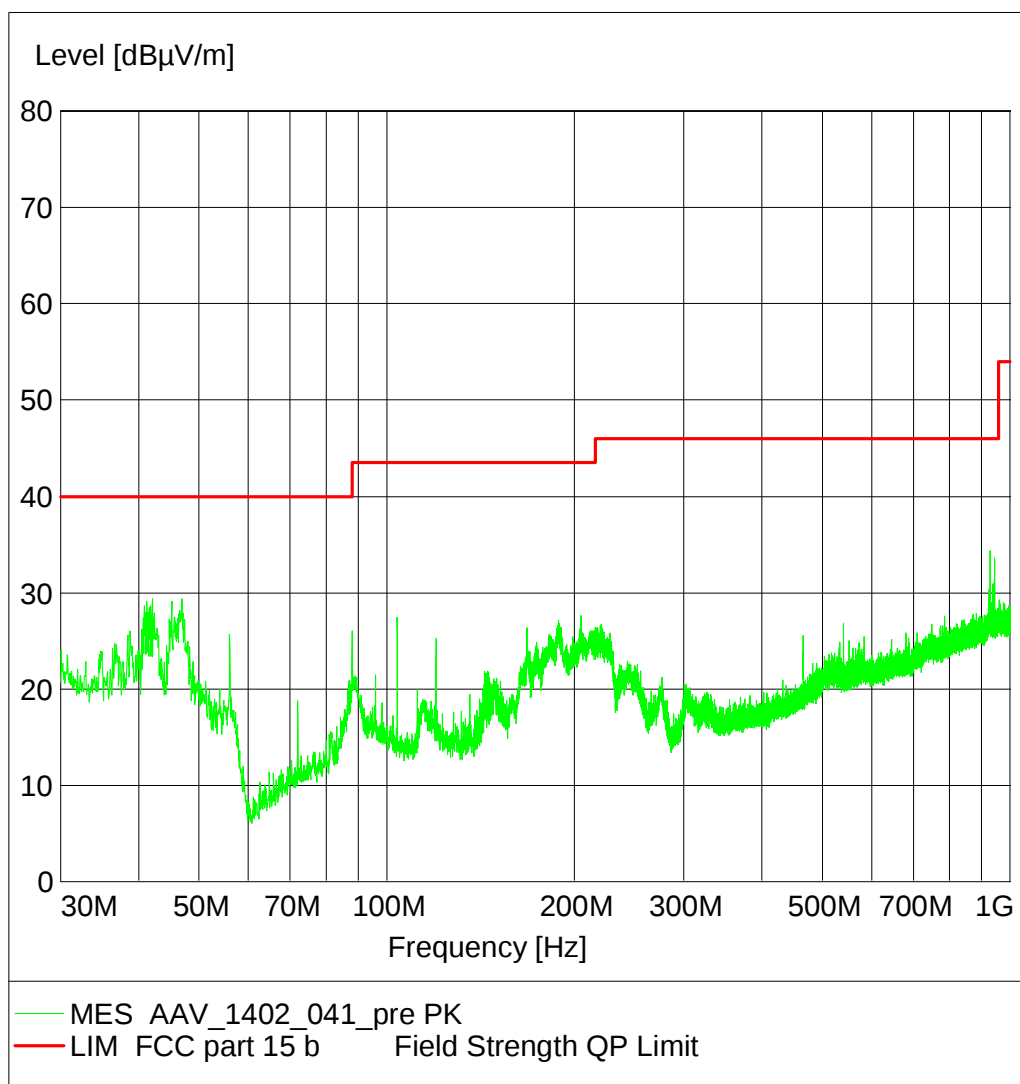
Detailed Results:

EMI RADIATED TEST

EUT: (DE1004003ad01)
Manufacturer: AAVAM
Operating Condition: BT TX on 2441 MHz, 1-DH1, loopback mode, 120V/60Hz
Test Site: 7 layers, Ratingen
Operator: Doe
Test Specification: FCC part 15 b
Comment: Horizontal EUT position, AC/DC-Setup
Start of Test: 23.07.2014 / 06:59:45

SCAN TABLE: "FCC part 15 b"

Short Description:			FCC part 15 b			
Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	60.0 kHz	MaxPeak	1.0 ms	120 kHz	HL562



4 Test Equipment Details

4.1 List of Used Test Equipment

The calibration, hardware and software states are shown for the testing period.

Test Equipment Anechoic Chamber

Lab ID:	Lab 2		
Manufacturer:	Frankonia		
Description:	Anechoic Chamber for radiated testing		
Type:	10.58x6.38x6.00 m ³		
	<i>Calibration Details</i>	<i>Last Execution</i>	<i>Next Exec.</i>
	NSA (FCC)	2014/01/09	2017/01/09

Single Devices for Anechoic Chamber

<i>Single Device Name</i>	<i>Type</i>	<i>Serial Number</i>	<i>Manufacturer</i>
Air compressor	none	-	Atlas Copco
Anechoic Chamber	10.58 x 6.38 x 6.00 m ³	none	Frankonia
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	FCC listing 96716 3m Part15/18		2014/01/09 2017/01/08
Controller Maturo	MCU	961208	Maturo GmbH
EMC camera	CE-CAM/1	-	CE-SYS
EMC camera Nr.2	CCD-400E	0005033	Mitsubishi
Filter ISDN	B84312-C110-E1		Siemens&Matsushita
Filter Universal 1A	BB4312-C30-H3	-	Siemens&Matsushita

Test Equipment Auxiliary Equipment for Conducted emissions

Lab ID: Lab 1
Manufacturer: Rohde & Schwarz GmbH & Co.KG
Description: EMI Conducted Auxiliary Equipment

Single Devices for Auxiliary Equipment for Conducted emissions

Single Device Name	Type	Serial Number	Manufacturer		
Cable "LISN to ESI"	RG214	W18.03+W48.03	Huber&Suhner		
Impedance Stabilization Network	ISN T800	36159	Teseq GmbH		
	<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration			2014/02/06	2016/02/28
Impedance Stabilization Network, Coupling Decoupling Network	ISN/CDN ENY41	100002	Rohde & Schwarz GmbH & Co. KG		
	<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	Standard calibration			2013/03/01	2015/03/31
Impedance Stabilization Network, Coupling Decoupling Network	ISN/CDN ST08	36292	Teseq GmbH		
	<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	Standard calibration			2014/01/10	2016/01/31
Impedance Stabilization Network, Coupling Decoupling Network	ISN/CDN T8-Cat6	32187	Teseq GmbH		
	<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration			2014/01/08	2016/01/31
One-Line V-Network	ESH 3-Z6	100489	Rohde & Schwarz GmbH & Co. KG		
	<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	standard calibration			2014/06/18	2017/11/30
One-Line V-Network	ESH 3-Z6	100570	Rohde & Schwarz GmbH & Co. KG		
	<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration			2013/11/25	2016/11/24
Two-Line V-Network	ESH 3-Z5	828304/029	Rohde & Schwarz GmbH & Co. KG		
	<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	Standart Calibration			2013/03/01	2015/02/28
Two-Line V-Network	ESH 3-Z5	829996/002	Rohde & Schwarz GmbH & Co. KG		
	<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration			2013/03/01	2015/02/28

Test Equipment Auxiliary Equipment for Radiated emissions

Lab ID: Lab 2
Description: Equipment for emission measurements
Serial Number: see single devices

Single Devices for Auxiliary Equipment for Radiated emissions

Single Device Name	Type	Serial Number	Manufacturer		
Antenna mast	AM 4.0	AM4.0/180/11920 513	Maturo GmbH		
Biconical Broadband Antenna	SBA 9119	9119-005	Schwarzbeck		
Biconical dipole	VUBA 9117	9117-108	Schwarzbeck		
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>	
	Standard Calibration		2012/01/18	2015/01/17	
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32-5P	849785	Miteq		
Broadband Amplifier 1GHz-4GHz	AFS4-01000400-1Q-10P-4	-	Miteq		
Broadband Amplifier 30MHz-18GHz	JS4-00101800-35-5P	896037	Miteq		
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01-2+W38.01-2	Kabel Kusch		
Cable "ESI to Horn Antenna"	UFB311A+UFB293C	W18.02-2+W38.02-2	Rosenberger Micro-Coax		
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz GmbH & Co. KG		
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>	
	Standard Calibration		2012/05/18	2015/05/17	
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz GmbH & Co. KG		
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>	
	Standard Calibration		2012/06/26	2015/06/25	
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic		
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic		
High Pass Filter	5HC3500/12750-1.2-KK	200035008	Trilithic		
High Pass Filter	WHKX 7.0/18G-8SS	09	Wainwright		
Horn Antenna Schwarzbeck 15-26 GHz BBHA 9170	BBHA 9170				
Log.-per. Antenna	HL 562 Ultralog	100609	Rohde & Schwarz GmbH & Co. KG		
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>	
	Standard Calibration		2012/12/18	2015/12/17	
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz GmbH & Co. KG		
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz GmbH & Co. KG		
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>	
	Standard calibration		2011/10/27	2014/10/26	
Pyramidal Horn Antenna 26,5 GHz	3160-09	00083069	EMCO Elektronik GmbH		

Single Devices for Auxiliary Equipment for Radiated emissions (continued)

Single Device Name	Type	Serial Number	Manufacturer
Pyramidal Horn Antenna 40 GHz	3160-10	00086675	EMCO Elektronik GmbH
Tilt device Maturo (Rohacell)	Antrieb TD1.5-10kg	TD1.5-10kg/024/3790709	Maturo GmbH

Test Equipment Auxiliary Test Equipment

Lab ID:	Lab 2
Manufacturer:	see single devices
Description:	Single Devices for various Test Equipment
Type:	various
Serial Number:	none

Single Devices for Auxiliary Test Equipment

Single Device Name	Type	Serial Number	Manufacturer
Broadband Power Divider N (Aux)	1506A / 93459	LM390	Weinschel Associates
Broadband Power Divider SMA	WA1515	A855	Weinschel Associates
Digital Multimeter 03 (Multimeter)	Fluke 177	86670383	Fluke Europe B.V.
		<i>Calibration Details</i>	<i>Last Execution Next Exec.</i>
		Customized calibration	2013/12/04 2015/12/03
Fibre optic link Satellite (Aux)	FO RS232 Link	181-018	Pontis
Fibre optic link Transceiver (Aux)	FO RS232 Link	182-018	Pontis
Isolating Transformer	LTS 604	1888	Thalheimer Transformatorenwerke GmbH
Notch Filter Ultra Stable (Aux)	WRCA800/960-6EEK	24	Wainwright
Signal Analyzer	FSV30	103005	Rohde & Schwarz GmbH & Co. KG
		<i>Calibration Details</i>	<i>Last Execution Next Exec.</i>
		Standard	2014/02/10 2016/02/09
Spectrum Analyser	FSP3	836722/011	Rohde & Schwarz GmbH & Co. KG
		<i>Calibration Details</i>	<i>Last Execution Next Exec.</i>
		Standard	2012/06/13 2015/06/12
Spectrum Analyser	FSU26	200418	Rohde & Schwarz GmbH & Co.KG
		<i>Calibration Details</i>	<i>Last Execution Next Exec.</i>
		Standard calibration	2013/07/29 2014/07/28
		Standard calibration	2014/07/29 2015/07/28
Vector Signal Generator	SMIQ 03B	832492/061	Rohde & Schwarz GmbH & Co.KG

Test Equipment Digital Signalling Devices

Lab ID: Lab 1, Lab 2
Description: Signalling equipment for various wireless technologies.

Single Devices for Digital Signalling Devices

Single Device Name	Type	Serial Number	Manufacturer
Bluetooth Signalling Unit CBT	CBT	100589	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		Last Execution Next Exec.
	Standard calibration		2011/11/24 2014/11/23
CMW500	CMW500	107500	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		Last Execution Next Exec.
	Standard calibration		2014/01/27 2016/01/26
Digital Radio Communication Tester	CMD 55	831050/020	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		Last Execution Next Exec.
	Standard calibration		2011/11/28 2014/11/27
Universal Radio Communication Tester	CMU 200	102366	Rohde & Schwarz GmbH & Co. KG
	HW/SW Status		Date of Start Date of End
	Hardware: B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B56V14, B68 3v04, PCMCIA, U65V04 Software: K21 4v21, K22 4v21, K23 4v21, K24 4v21, K42 4v21, K43 4v21, K53 4v21, K56 4v22, K57 4v22, K58 4v22, K59 4v22, K61 4v22, K62 4v22, K63 4v22, K64 4v22, K65 4v22, K66 4v22, K67 4v22, K68 4v22, K69 4v22 Firmware: µP1 8v50 02.05.06 ---		2007/07/16
Universal Radio Communication Tester	CMU 200	837983/052	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		Last Execution Next Exec.
	Standard calibration		2011/12/07 2014/12/06
	HW/SW Status		Date of Start Date of End
	HW options: B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B54V14, B56V14, B68 3v04, B95, PCMCIA, U65V02 SW options: K21 4v11, K22 4v11, K23 4v11, K24 4v11, K27 4v10, K28 4v10, K42 4v11, K43 4v11, K53 4v10, K65 4v10, K66 4v10, K68 4v10, Firmware: µP1 8v40 01.12.05 --- SW: K62, K69		2007/01/02 2008/11/03
Vector Signal Generator	SMU200A	100912	Rohde & Schwarz GmbH & Co. KG

Test Equipment Emission measurement devices

Lab ID: Lab 1, Lab 2
Description: Equipment for emission measurements
Serial Number: see single devices

Single Devices for Emission measurement devices

Single Device Name	Type	Serial Number	Manufacturer
Personal Computer	Dell	30304832059	Dell
Power Meter	NRVD	828110/016	Rohde & Schwarz GmbH & Co.KG
<i>Calibration Details</i>			<i>Last Execution</i> <i>Next Exec.</i>
Standard calibration			2014/05/13 2015/05/12
Sensor Head A	NRV-Z1	827753/005	Rohde & Schwarz GmbH & Co.KG
<i>Calibration Details</i>			<i>Last Execution</i> <i>Next Exec.</i>
Standard calibration			2014/05/13 2015/05/12
Signal Generator	SMR 20	846834/008	Rohde & Schwarz GmbH & Co. KG
Spectrum Analyzer	ESIB 26	830482/004	Rohde & Schwarz GmbH & Co. KG
<i>Calibration Details</i>			<i>Last Execution</i> <i>Next Exec.</i>
Standard Calibration			2014/01/07 2016/01/31
<i>HW/SW Status</i>			<i>Date of Start</i> <i>Date of End</i>
Firmware-Update 4.34.4 from 3.45 during calibration			2009/12/03

Test Equipment Shielded Room 02

Lab ID: Lab 1
Manufacturer: Frankonia
Description: Shielded Room for conducted testing
Type: 12 qm
Serial Number: none

Test Equipment T/A Logger 13

Lab ID: Lab 1, Lab 2
Description: Lufft Opus10 TPR
Type: Opus10 TPR
Serial Number: 13936

Single Devices for T/A Logger 13

Single Device Name	Type	Serial Number	Manufacturer
ThermoAirpressure Datalogger 13 (Environ)	Opus10 TPR (8253.00)	13936	Lufft Mess- und Regeltechnik GmbH
<i>Calibration Details</i>			<i>Last Execution</i> <i>Next Exec.</i>
Customized calibration			2013/02/07 2015/02/06

Test Equipment T/H Logger 02

Lab ID: Lab 1
Description: Lufft Opus10
Serial Number: 7489

Single Devices for T/H Logger 02

Single Device Name	Type	Serial Number	Manufacturer
ThermoHygro Datalogger 02 (Environ)	Opus10 THI (8152.00)	7489	Lufft Mess- und Regeltechnik GmbH
<i>Calibration Details</i>			<i>Last Execution</i> <i>Next Exec.</i>
Customized calibration			2013/02/07 2015/02/06

Test Equipment T/H Logger 12

Lab ID: Lab 2
Description: Lufft Opus10
Serial Number: 12482

Single Devices for T/H Logger 12

Single Device Name	Type	Serial Number	Manufacturer
ThermoHygro Datalogger 12 (Environ)	Opus10 THI (8152.00)	12482	Lufft Mess- und Regeltechnik GmbH
<i>Calibration Details</i>			<i>Last Execution</i> <i>Next Exec.</i>
Customized calibration			2013/01/07 2015/01/06

5 Annex

5.1 Additional Information for Report

Test Description

Conducted emissions (AC power line)

Standard FCC Part 15 Subpart B

The test was performed according to: ANSI C 63.4, 2009

Test Description

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2009. The Equipment Under Test (EUT) was setup in a shielded room to perform the conducted emissions measurements in a typical installation configuration. The EUT was connected to a 50 μ H || 50 Ohm Line Impedance Stabilization Network (LISN), which meets the requirements of ANSI C63.4-2009, Annex B, in the frequency range of the measurements. The LISN's unused connections were terminated with 50 Ohm loads. AC Power supply voltage for EUT: 120 V 60 Hz (if not stated within the measurement plot and/or test result).

The measurement procedure consists of two steps. It is implemented into the EMI test software ES-K1 from R&S.

Step 1: Preliminary scan

Intention of this step is, to determine the conducted EMI-profile of the EUT.

EMI receiver settings:

- Detector: Peak - Maxhold
- Frequency range: 150 kHz – 30 MHz
- Frequency steps: 5 kHz
- IF-Bandwidth: 9 kHz
- Measuring time / Frequency step: 20 ms
- Measurement on phase + neutral lines of the power cords

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.

Step 2: Final measurement

Intention of this step is, to determine the highest emissions with the settings defined in the test specification for the frequencies identified in step 1.

EMI receiver settings:

- Detector: Quasi-Peak
- IF - Bandwidth: 9 kHz
- Measuring time: 1 s / frequency

At each frequency determined in step 1, four measurements are performed in the following combinations:

- 1) Neutral lead - reference ground (PE grounded)
- 2) Phase lead - reference ground (PE grounded)
- 3) Neutral lead - reference ground (PE floating)
- 4) Phase lead - reference ground (PE floating)

The highest value is reported.

Test Requirements / Limits

If not stated within the measurement plot and/or test result, class B limits are applied.

FCC Part 15, Subpart B, §15.107, Class B Limit

Frequency Range (MHz)	QP Limit (dB μ V)	AV Limit (dB μ V)
0.15 – 0.5	66 to 56	56 to 46
0.5 – 5	56	46
5 – 30	60	50

FCC Part 15, Subpart B, §15.107, Class A Limit

Frequency Range (MHz)	QP Limit (dBμV)	AV Limit (dBμV)
0.15 - 0.5	79	66
0.5 - 30	73	60

Used conversion factor: Limit (dBμV) = 20 log (Limit (μV)/1μV).

NOTES:

A missing result table in the corresponding test report section means, that no final measurement was performed because no relevant frequencies (peaks) were found in the preliminary scan.

The chosen operating mode is selected as representative mode to generate "worst-case" conditions, i.e. high power consumption.

Spurious radiated emissions

Standard FCC Part 15, Subpart B

The test was performed according to: ANSI C 63.4, 2009

Test Description

Measurement below 1 GHz:

The test set-up was made in accordance to the general provisions of ANSI C 63.4-2009.

The Equipment Under Test (EUT) was set up on a non-conductive table 1.0 x 2.0 m in the semi-anechoic chamber. The influence of the EUT support table that is used between 30–1000 MHz was evaluated.

The test was performed at the distance of 3 m between the EUT and the receiving antenna. The measurement procedure is implemented into the EMI test software ES-K1 from R&S. The radiated emissions measurements were made in a typical installation configuration. Exploratory tests are performed at 3 orthogonal axes to determine the worst-case orientation of a body-worn or handheld EUT. The final test on all kind of EUTs is performed at 2 axes. A pre-check is also performed while the EUT is powered from both AC and DC (battery) power in order to find the worst-case operating condition. AC Power supply voltage for EUT: 120 V 60 Hz (if not stated within the measurement plot and/or test result).

Step 1: Preliminary scan (test to identify the highest amplitudes relative to the limit)

Intention of this step is, to determine the radiated EMI-profile of the EUT.

Settings for step 1:

- Detector: Peak-Maxhold
- Frequency range: 30 – 1000 MHz
- Frequency steps: 60 kHz
- IF-Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 μs
- Turntable angle range: –180° to +180°
- Turntable step size: 90°
- Height variation range: 1 – 3 m
- Height variation step size: 2 m
- Polarization: Horizontal + Vertical

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.

Step 2:

A further measurement will be performed on the frequencies determined in step 1. Intention of this step is, to find out the approximate turntable angle and antenna height for each frequency.

Settings for step 2:

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: –180° to +180°
- Turntable step size: 45°
- Height variation range: 1 – 4 m
- Height variation step size: 0.5 m
- Polarizations: horizontal + vertical

After this step the EMI test system has determined the following values for each frequency (of step 1):

- Frequency
- Azimuth value (of turntable)
- Antenna height

The last two values have now the following accuracy:

- Azimuth value (of turntable): 45°
- Antenna height: 0.5 m

Step 3: final measurement

In this step the accuracy of the turntable azimuth and antenna height will be improved. This is necessary to find out the maximum value of every frequency.

For each frequency, which was determined the turntable azimuth and antenna height will be adjusted. The turntable azimuth will be slowly varied by +/- 22.5° around this value. During this action the value of emission is continuously measured. The turntable azimuth at the highest emission will be recorded and adjusted. In this position the antenna height is also slowly varied by +/- 25 cm around the antenna height determined. During this action the value of emission is also continuously measured. The antenna height of the highest emission will also be recorded and adjusted.

- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100ms
- Turntable angle range: -22.5° to +22.5° around the determined value
- Height variation range: -0.25 m to +0.25 m around the determined value

Step 4: Final measurement (with QP detector)

With the settings determined in step 3, the final measurement will be performed:

EMI receiver settings for step 4:

- Detector: Quasi-Peak(< 1GHz)
- Measured frequencies: in step 3 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

Measurement above 1 GHz:

The following modifications apply to the measurement procedure for the frequency range above 1 GHz:

The measurement distance was reduced to 1 m. The results were extrapolated by the extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements, inverse-linear-distance-squared for the power density measurements). Due to the fact that in this frequency range a double ridged wave guided horn antenna (up to 18 GHz) and a horn antenna (18–25 GHz) are used, the steps 2-4 as described before, are omitted. Step 1 was performed at one height of the receiving antenna only.

Detector: Peak, Average (simultaneously)

RBW = VBW = 1 MHz; above 7 GHz 100 kHz

Test Requirements / Limits

If not stated within the measurement plot and/or test result, class B limits are applied.

FCC Part 15, Subpart B, §15.109, Radiated Emission Limits

Frequency Range (MHz)	Class B Limit (dBµV/m)
30 – 88	40.0
88 – 216	43.5
216 – 960	46.0
above 960	54.0

Frequency Range (MHz)	Class A Limit (dBµV/m) / @ 3 m!
30 - 88	49.5
88 - 216	54.0
216 - 960	56.9
above 960	60.0

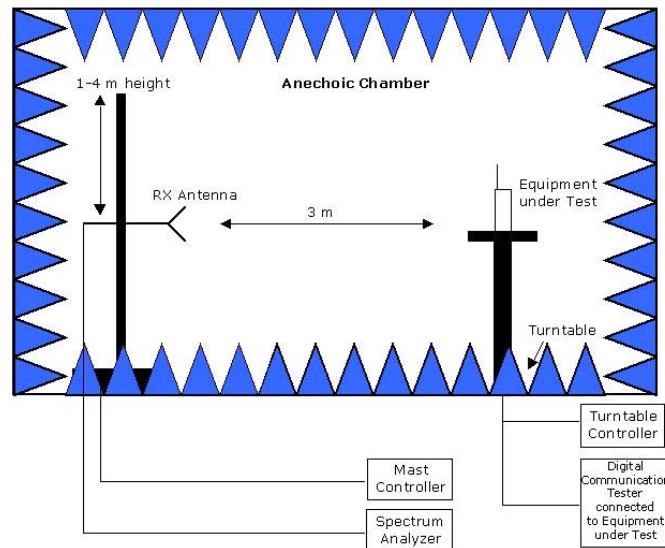
§15.35(b)

..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....

Used conversion factor: Limit (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)

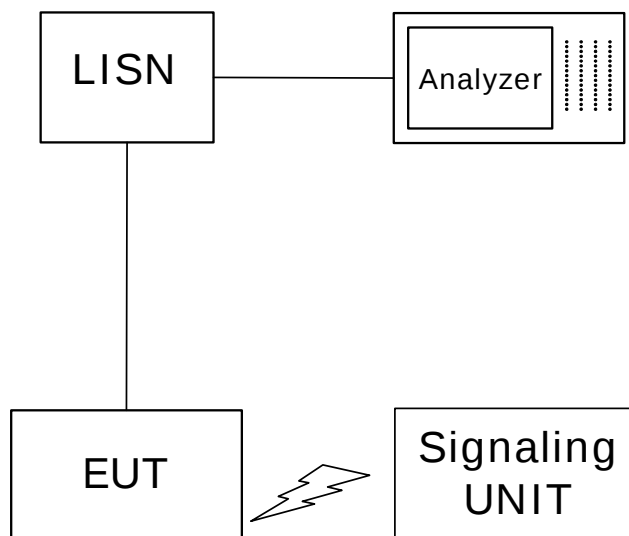
NOTE: A missing result table in the corresponding test report section means, that no final measurement was performed because no relevant frequencies (peaks) were found in the preliminary scan.

Setup Drawings



Remark: Depending on the frequency range suitable antenna types, attenuators or preamplifiers are used.

Setup in the Anechoic chamber. For measurements below 1 GHz the ground was replaced by a conducting ground plane.



Setup in the shielded room for conducted measurements at AC mains port

Correlation of measurement requirements from FCC and IC

Measurement	FCC reference	IC reference
Conducted Emissions (AC Power Line)	§15.107	ICES-001 Issue 4 or ICES-003 Issue 5 or RSS- Gen Issue 3
Radiated Spurious Emissions	§15.109	ICES-001 Issue 4 or ICES-003 Issue 5 or RSS- Gen Issue 3

Remarks:

1. FCC Part 15 subpart B, ICES 003 and CISPR 22 contain different definitions of Class A and Class B limits, i.e. which class is applicable to which kind of EUT.
ICES 003 and CISPR 22 distinguish between the location where the EUT is intended to operate whilst FCC refers to the method of commercial distribution (distributive trades).
2. The correct assignment of the appropriate class to the concrete EUT is not scope of this test report!
3. A radio apparatus that is specifically subject to an Industry Canada Radio Standard Specification (RSS) and which contains an ITE is not subject to ICES-003 provided the ITE is used only to enable operation of the radio apparatus and the ITE does not control additional functions or capabilities.
4. ISM (Industrial, Scientific or Medical) radio frequency generators, though they may contain ITE, are excluded from the definition of ITE and are not subject to ICES-003. They are instead subject to the Interference-Causing Equipment Standard ICES-001, which specifically addresses ISM radio frequency generators.
5. The kind of EUT (ITE, ISM, Radio) determines which IC Standard is applicable.

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